

## CLAIMS

The new combustion chamber throat design, shown in Figure 3 and Figure 4, will be more successful in preventing plugging in the throat area (Claim 1). This design will also eliminate the frequent damages that have occurred to the throat refractory (Claim 2), because silicon carbide and silicon nitride can withstand higher temperatures and the erosive and corrosive effects of vanadium oxide type compounds better than alumina.

This patent suggestion also proposes eliminating the plenum chamber area shown in Figure 2. The quench ring area of the traditional quench gasifier is prone to frequent damage (References: U.S. Patent No. 4,828,580 and Patent No. 4,828,579). This new design (shown in Figure 3) will be more successful in preventing damage to the quench ring than the designs shown in Figures 1 and 2 (Claim 3), because the distance between the throat opening and the quench ring is longer in the new design. Overall, this new design will improve the gasifier on-stream time (reliability of operations) and thereby lower the gasifier operating cost (Claim 4).

The high temperatures obtained by electrical heating in the throat are will also increase the gasification reaction rates and thereby increase the carbon conversion of the gasifier by 0.1 to 3.0 percent (Claim 5). This in turn will increase the syngas production of the gasifier without increasing either oxygen consumption or feedstock consumption (Claim 6).

The use of electrical heating and silicon carbide type refractories in the throat area will also reduce the consumption of the steam as a temperature moderator (Claim 7), because it will not be necessary to moderate the temperatures. Normally approximately 0.25 to 0.35 pound of steam is required for gasification of every 1.0 pound of residual oil or coke or coal. With this new design, the steam requirement will drop to 0.15 to 0.25 pound of steam per pound of feedstock.

Due to the increased carbon conversion achieved with this design, it will be possible to eliminate the soot recovery and soot recycle system that is normally employed downstream of the gasifier. Thus electrical heating of the throat area will reduce the gasification plant capital cost (Claim 8). The concept of electrical heating of the refractory can be extended to the entire gasifier hot face. If the entire hot face of the gasifier (not just the throat area) is electrically heated, it will be possible to preheat and cure the gasifier refractories electrically. There will be no need for using a preheat burner, a flue gas cooler and an aspirator (steam ejector) for preheating refractories. This will reduce the gasification plant capital cost further (Claim 9).